

# MATH281 200610 Problem Set 6 DRAFT

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1. (Based on 4.2.8, 4.2.10, and 4.2.14.) For each of the following homogeneous linear differential equations, verify that the given function is a solution to the equation, and then use reduction of order to find a general solution to the equation.

(a)  $6y'' + y' - y = 0$ ;  $y_1 = e^{x/3}$

(b)  $x^2y'' + 2xy' - 6y = 0$ ;  $y_1 = x^2$

(c)  $x^2y'' - 3xy' + 5y = 0$ ;  $y_1 = x^2 \cos(\ln x)$

2. (Based on 4.2.18 and 4.2.20.) For each of the following non-homogeneous linear differential equations, verify that the given function is a solution to the corresponding homogeneous linear differential equation, use reduction of order to find the general solution to the homogeneous linear differential equation, and use the method of reduction of order to find a particular solution to the non-homogeneous linear differential equation. Summarize your results by giving the general solution to the non-homogeneous linear differential equation.

(a)  $y'' + y' = 1$ ;  $y_1 = 1$

(b)  $y'' - 4y' + 3y = x$ ;  $y_1 = e^x$

3. (Based on 4.3.4, 4.3.6, and 4.3.12.) Find the general solution of each of the following second order differential equations.

(a)  $y'' - 3y' + 2y = 0$

(b)  $y'' + 4y' - y = 0$

(c)  $2y'' + 2y' + y = 0$

4. (Based on 4.3.18, 4.3.24, and 4.3.28.) Find the general solution of each of the following higher order differential equations.

(a)  $y''' + 3y'' - 4y' - 12y = 0$

(b)  $y^{(4)} - 2y'' + y = 0$

(c)  $2\frac{d^5x}{dx^5} - 7\frac{d^4x}{ds^4} + 12\frac{d^3x}{ds^3} + 8\frac{d^2x}{ds^2} = 0$

5. (Based on 4.3.38 and 4.3.40.) Solve the given boundary value problems.

(a)  $y'' + 4y = 0$ ;  $y(0) = 0$ ,  $y(\pi) = 0$

(b)  $y'' - 2y' + 2y = 0$ ;  $y(0) = 1$ ,  $y(\pi) = 1$

For additional practice you should try problems 4.2.1–20 and 4.3.1–48.